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NOTICE TO SUBSCRIBERS.

We consider it due to those subscribers who have favored us with their subscriptions, previous to the publication of our club rates, that they should have the privileges of the list. They can therefore send us subscriptions for any or all of the publications named at the reduced double rates, less $4, the subscription price of "SCIENCE."

We have studiously avoided occupying the pages of this journal with personal reference to its progress, but the conclusion of the first volume appears to be an appropriate moment to offer a few words on this subject, and to acknowledge our obligations to those, who, by their subscriptions or literary contributions, have aided in making "SCIENCE" a success.

A selection from the letters addressed to us by scientific investigators, approving of the management of the journal, or containing congratulations for the future, would fill the pages of this number; having only a column at our service, we make but one reference, which appears to epitomize all previous communications.

In a letter recently received from the last President of the Association for the Advancement of Science, Professor GEORGE F. BARKER, are these words:

"I take this opportunity to congratulate you on the success of "SCIENCE." The numbers which I have seen have been creditable to all concerned."

With this testimony to the standing of the journal from so severe a critic and one so eminently capable of forming an opinion of what a scientific journal should be, we might be well content to rest, but being fully aware that better results may be attained, our unremitting efforts in the future will be directed to secure a still higher standard, and more perfect development of the various departments.

We would remind specialists, who desire to see certain branches more fully represented in "SCIENCE," how much may be accomplished by individual efforts. As an instance, we may refer to our astronomical department, which already reflects the high attainments and *esprit de corps* of those following this line of research.

Twenty-six weeks only have elapsed since our first number was issued, of which period the first half was a time of recreation and rest, when few were within reach of our announcements; it is therefore a subject of congratulation that in so short a time our pages show a vitality indicative of a journal which has existed years rather than a few weeks.

It is a pleasure to find on our subscription list the names of so many representative scientific men, both of the United States and Canada, while all the leading Universities and Colleges of this country receive "SCIENCE" through members of their faculties. This journal is also now circulating in England, France, Germany and Italy.

We have placed several pages weekly at the service of the Smithsonian Institution, and are willing to increase the number of our sheets as the matter awaits publication. This offer has been so far accepted, that arrangements are in progress, by which the difficulty of compilation may be overcome.

We have demonstrated that a really scientific weekly journal can be conducted without conflicting with the old established monthlies, which have their special field of usefulness, and when the editor of the AMERICAN JOURNAL OF SCIENCE (which may be considered one of the institutions of this country) sent us his good wishes for success, we accepted his greeting in all sincerity.

England, France, Germany and Italy, have each their representative weekly scientific journal. Is there an American scientist with so poor an opinion of the scientific work of his country, or of his fellow workers, as to think the same convenience for the United States superfluous?

"SCIENCE" has received a welcome and strong support far beyond the expectations of the editor; but it must be apparent to all that the personal co-operation of every scientific man, in the future, will not only insure the permanency of the publication, but increase its usefulness and value; let all, then, who are interested in the promotion and advancement of science in the United States, whether professionally engaged or as student, or amateur, feel that one and all are invited to assist in the work.

Those who are acquainted with journalism must be aware that the capital employed in this enterprise has been advanced for the best interests of science rather than for speculative purposes. The editor, therefore, in making this appeal for general co-operation, feels that he may do so without danger of misinterpretation of his motives.

SOME RECENT AMERICAN PAPERS IN COMPARATIVE ANATOMY.

Marsh, O. C.—The limbs of *Sauranodon*, with notice of a new species. *American Journal of Science*, Feb. 1880, pp. 169–171 ; 1 figure.

Morse, E. S.—On the Identity of the Ascending Process of the Astragalus in Birds with the Intermedium. Anniversary Memoirs of the Boston Society of Natural History, 1880 ; pp. 10, 1 plate, 12 figures.

Chapman, H. C.—The Placenta and Generative Apparatus of the Elephant. Journal of the Academy of Natural Sciences of Philadelphia, VIII, 1880. 4 plates, 1 figure, 11 pages.

Chapman, H. C.—On the structure of the Orang Outang. Proceedings of the Academy of Natural Sciences, 1880. 16 pages, 7 plates.

Among the many surprises which science owes to the paleontological discoveries of Professor Marsh, few are more notable than the condition of the limbs in *Sauranodon*. In the present paper Professor Marsh describes the limbs with some detail, and gives a figure of the left hind paddle of *S. discus*. In each limb the proximal segment consists of a single bone which undoubtedly represents the humerus or femur. The following four segments consist respectively of three, four, five and six approximately discoid pieces, which are interpreted as representing the bones of the antebrachium or crus, the two rows of the carpalia or tarsalia, and the metacarpalia or metatarsalia of the ordinary vertebrate limb.

Regarding the carpalia or tarsalia as constituting a single segment, Professor Marsh suggests the following general names for the corresponding segments in the two limbs : propodial, epipodial, mesopodial, metapodial, and phalangial ; since the latter two terms have already been employed there seems to be no reason why the other three should not be accepted.

The figure seems to demonstrate the normal presence in this fossil reptile of six distinct digits or dactyls. "This is a character not before observed in any air-breathing vertebrate. Some of the Amphibians retain remnants of a sixth digit, and *Ichthyosaurus* often has, outside of the phalanges, one or more rows of marginal ossicles that probably represent lost digits. With these exceptions, the normal number of five is not exceeded."

This condition of things in *Sauranodon* is worthy of consideration in view of the not infrequent occurrence of *sexdigitism* with man and others of the higher vertebrates. Darwin had suggested that this anomaly might be due to reversion, but (The Descent of Man, 1, 120, note) afterward reluctantly abandoned the hypothesis in consequence of Gegenbaur's denial of the existence of more than the regular number of digits in the Ichthyopteriga. His original view is now strengthened by Professor Marsh's account of the limbs of *Sauranodon*, but does not yet serve to explain the occurrence of more than six digits with man, the cat, and perhaps other mammals.

The other striking peculiarity of the sauranodont limb is the presence of *three epipodial* elements. All of them articulate with the humerus or femur, and Prof. Marsh suggests that the intermediate one represents the *os intermedium* which, in most air-breathing vertebrates, is more closely associated with the mesopodial bones. He thinks its proper place is indicated in *Sauranodon*, but that, "in the process of differentiation this bone has been gradually crowded out of its original position."

In the paper cited Prof. Morse offers a different interpretation ; "That the bone which he (Marsh) indicates as the intermedium is really the fibula, and the bone which he represents as the fibula is an outer tarsal bone which, with its metatarsal and phalangeal bone in series becomes obliterated in time ; that, in the process of differentiation, the intermedium is as likely to be partially compassed by the distal extremities of the tibia and fibula, as that a third bone of this (epipodial) segment had been crowded down into the tarsal series." Pending the discovery of new facts in paleontology, embryology, or comparative anatomy, it is probable that most anatomists will be predisposed toward the view of Professor Morse.

Those who are interested in the general morphology of the vertebrate limb should not fail to read the suggestive facts and considerations presented by Prof. Huxley in his paper on Ceratodus, Proc. Zool. Soc. of London, Jan. 4, 1876.

Most of Professor Morse's paper consists in the presentation of facts in corroboration of the opinion advanced by him in 1872, that the intermedium is represented in most birds by the so-called "ascending process of the astragalus" which, in an embryo heron, had been found by the late Professor Jeffries Wyman to have a separate centre of ossification. Figures are given of the parts as they exist in several aquatic species, and there seems to be no reason for doubting the correctness of Professor Morse's conclusions. Our author also reproduces Cuvier's figure of the tarsal region of the "Honfleur Reptile," afterward named by Cope *Lælaps Gallicus*, and Cope's figures of the same parts of *Lælaps* and *Ornithotarsus*. He considers that the intermedium is distinctly represented as an ascending process with *Lælaps*, but is in doubt as to *Ornithotarsus*, whether it is "represented by the enlargement of the tibiale in front, or was a separate bone which occupied the fossa on the anterior face of the tibia." The manus of the sea-pigeon (*Uria grylle*) is figured to show the interesting presence of "rudimentary nails on the second and third fingers, (index and medius)."

Dr. Chapman has profited by the unusual opportunities afforded to a zealous anatomist by the extensive zoological garden of Philadelphia, and by the large menageries which sometimes have their winter-quarters in the same city, and the papers here cited contain important contributions to our knowledge concerning two forms whose structures and functions are far from thoroughly known.

A young Indian Elephant was born on the 9th of March, 1880, the gestation having lasted either twenty months and twenty days, or twenty-one months and fifteen days, according as it is dated from the last or the first of the seven observed opportunities for its commencement. "Immediately after birth the mother rolled the young one in the straw. The young elephant, a female, stood 30 inches (about 75 cm.) in height, measured from base of trunk to root of tail 35 inches (about 88 cm.), and weighed 213½ pounds (about 97 kilograms). It was perfectly formed and well-developed ; it was noticed immediately that it sucked with the mouth, and not with the trunk, as Buffon reasoned it must do—an error so often repeated in works on Natural History.

Dr. Chapman was fortunate enough to obtain the fresh membranes, and to have them well injected. The figures and descriptions indicate that, as Turner had concluded from less perfect materials, the placenta of the elephant is *deciduous* as in the Primates and Carnivora, and *zonular* as in the latter group.

The generative apparatus of the female elephant presents some peculiar features, and although our author begins his concluding paragraph by saying, "it appears to me that there can be little doubt now that the generative organs in both species of elephant are understood," yet his admission, in a foot note, that what he had called vagina may be really an elongated *cervix uteri*, will lead other anatomists to avail themselves of any opportunity that may present in itself for further study of this portion of the proboscidean structure.

The anatomical account of the Orang is full of interesting facts and ideas, but most of them have been outlined already in No. 25 of this Journal. Like nearly all of the Orangs, whose brains have been examined, this example was young, estimated to be about three years old. The immaturity of the brain, together with the probability of considerable individual variation in the details of the cerebral fissures, should be taken into account in estimating the resemblances and differences with respect to man and the other anthropoids. Possibly these considerations may apply also to the somewhat mooted question as to the extent to which the occipital lobes of the cerebrum project over the cerebellum. Here, however, there enters

another element than the distortion or displacement to which Dr. Chapman very properly refers, namely, the *position in which the brain is held or placed.* In Dr. Chapman's figures, the organ rests upon the medulla, and upon the ventral aspects of the frontal and temporal lobes; were it brought into something approximate to its natural position, or to the position of the human brain, the occipital lobes would surely project beyond the cerebellum to an appreciable extent. It would be well if the next Orang's head should be sawn into sections parallel with the mesial plane, and the brain figured *in situ.*

It is gratifying to find Dr. Chapman, like Humphrey and Barnard, insisting that the "scansorius" muscle of Traill is really the entoglutæus. But Dr. Chapman does not seem to have observed the curious little muscle passing over the capsule of the acetabulum which Prof. Barnard has called "ilio-femoralis subrectus," and which, in the opossum, Coues seems to have mistaken for the unlucky "scansorius."

A novel and significant suggestion is that, "morphologically speaking, the laryngeal pouch of the anthropoids would be homologous with and replace the two layers of the cervical fascia in man."

This otherwise very commendable paper is marred by some important misspellings, as of *ilium* which is made *ileum* twice on page 4, and by an occasional obscurity of style which sometimes renders the author's meaning doubtful.

B. G. W.

ON THE CONSTITUTION OF THE NAPHTHALINES AND THEIR DERIVATIVES.

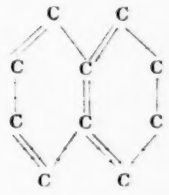
(Translated from the German.)

BY M. BENJAMIN, PH. B., AND T. TONNELÉ, PH. B.*

Among the many aromatic hydrocarbons, naphthaline is one of the most interesting. The causes and laws of isomerism may be studied from the numerous isomeric compounds on one hand, while on the other, much information is derived from the consideration that many of these have acquired a great importance in the technical arts. In consequence of this, a great number of memoirs exist on this subject, and they are scattered abroad among the numerous scientific journals. It is, therefore, no simple matter for one to obtain a clear survey of the naphthaline question. We hope that the following pages, comprising material originally collected for our own information, will be welcomed by such of our professional colleagues as may have occasion to study this subject, for we feel assured that by consulting this article much of their time and labor will be economized.

CONSTITUTION OF NAPHTHALINE.

Naphthaline was discovered in 1826, by Garden, and subsequently widely studied by many investigators; yet its constitution remained undetermined for more than forty years. In the year 1866, Kékulé[1] published his ingenious and fertile theory of the aromatic compounds, considering them as derivatives from a single hydrocarbon, benzol. Soon after Erlenmeyer[2] so extended this theory as to include naphthaline, which he considered as having been derived from two benzol rings possessing two carbon atoms in common.



Graebe[3] was the first to demonstrate the correctness of this theory, in the course of his remarkable researches on the chinones of benzol and naphthaline. Since then this theory has been sustained by a large number of facts, while no satisfactory objections have been brought forward against it.

Other formulæ have been proposed by Berthelot[4], and later by Ballo[5], and also by Wreden[6], but none of these have received the approval of chemists.

The following are the principal facts which support the formula given by Erlenmeyer and Graebe:

I. The bichlornaphtochinon (C_6H_4) ($C_4Cl_2O_2$) yields on oxidation phthalic acid $C_6H_4\{^{COOH}_{COOH}$ and it is also transformed by the action of pentachloride of phosphorus into the pentachloride of naphthaline (C_6H_3Cl) (C_4Cl_4) and this on oxidation produces tetrachlorphthalic acid $C_6Cl_4\{^{COOH}_{COOH}$.

These facts prove that naphthaline is composed of two symmetrical rings, and that it can only have the formula of Erlenmeyer by the acceptance of Kékulé's benzol scheme.

On the other hand, the ortho- (1, 2) position of phthalic acid is likewise shown which was corroborated by the examination of the benzol bi-derivatives (Graebe).[7]

Ladenburg[8] and Wreden[9] have objected to Graebe's method of proof, on account of the derivation of tetrachlorphthalic acid from phthalic being uncertain. It can just as well be obtained from tere or isophthalthic acid. This is improbable, because the tetra-chlorphthalic acid used, agrees in all its properties (formation of anhydrides, etc.), with phthalic acid, and not with its two isomers.*

II. Naphthalinetetrachloride (C_6H_4), ($C_4H_4Cl_4$), by oxidation gives phthalic acid $C_6H_4\{^{COOH}_{COOH}$ (Laurent). On submitting it to dry distillation it becomes converted into the α and β dichloronaphthaline (C_6H_4) ($C_4H_2Cl_2$) and the latter (β) produces, on oxidation, dichlorophtalic acid $C_6H_2Cl_2\{^{COOH}_{COOH}$ (Atterberg).[10]

III. Monochloronaphthalinetetrachloride $C_6H_4(C_4H_3Cl\,Cl)_4$ may be converted into ordinary phthalic acid by oxidation. (P. and E. Depouilly[11] and Widman[12].) Monochloronaphthaline, $C_6H_4(C_4H_3Cl)$ which is the basis of the above compounds may be converted into

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* NOTE.—The following memoir, written by MM. F. Reverdin and E. Nötting, was published in Geneva early this year. In addition to the text herewith given, the original pamphlet was supplemented with several valuable tables. These showed the derivation and behavior with reagents of the various substitution products. It is with regret that we are obliged to omit them. The space which they would occupy, together with the fact that they are not of general interest, does not seem to warrant their insertion. The entire article is undoubtedly the best resumé of the different theories concerning the formation of the naphthalines in existence. (*Translators.*)

[1] Annalen der Chemie und Pharmacie, vol. CXXXVII, p. 129 (1866).

[2] Ann. Chem. Pharm., CXXXVII, 346 (1866).

[3] Ann. Chem. Pharm., CXLIX, 1 (1869).

[4] Ann. Chem. Pharm., CXLII, 251 (1867). Comptes Rendus, LXIII, 788 and 834.

[5] Das Naphtalin und seine Derivate. Braunschweig (1870).

[6] Deutsche Chem. Ges., IX, 590 (1876.)

[7] Ann. Chem. Pharm., CXLIX, 1 (1869.)

[8] Theorie der aromatischen Verbindungen Braunschweig. 1876, p. 36.

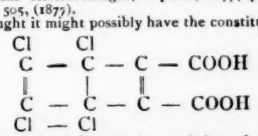
[9] Deutche Chem. Ges., IX, 547 (1877).

[10] Deutsche Chem. Ges. IX, 547, (1877).

[11] Soc. Chim., Paris, IV, 10, (1865).

[12] Om Naftalins Klorföreningar, Upsala, 1877, p. 16. Soc. Chim. Paris, XXVIII, 505, (1877).

*Wreden thought it might possibly have the constitution,



that is to say, be derived from an isometric hypothetic benzol. This is however, extremely improbable.

chloronitrophthalic acid $C_6 H_2 Cl (NO_2), \begin{cases} COOH \\ COOH \end{cases}$ (Atterberg).[10]

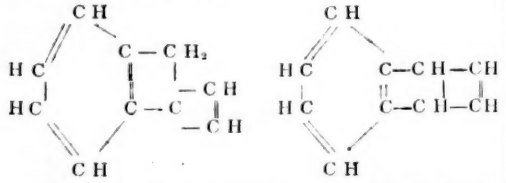
IV. This same monochloronaphthalinetetrachloride yields on saponification with alcoholic potash the *a* trichloronaphthaline $C_6 H_4 (C_4 Cl_3 H)$ melting at 81°, and this, by oxidation, produces trichloronitrophthalic acid. $C (NO_2) Cl_2 \begin{cases} COOH \\ COOH \end{cases}$. (Widman.[13])

V. Mononitronaphthaline $C_6 H_3 (NO_2) (C_4 H_4)$ produces, by oxidation with chromic acid, nitrophthalic acid $C_6 H_3 (NO_2) \begin{cases} COOH \\ COOH \end{cases}$ melting at 212°, which can also be obtained directly from phthalic acid by the action of nitric acid. (Beilstein and Kurbatow.[14])

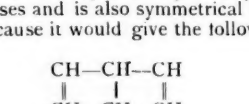
On the other hand, naphthylamine $C_6 H_3 (NH_2) (C_4 H_4)$ which corresponds to this nitronaphthaline may be oxidized, by means of permanganate, into ordinary phthalic acid [15] (Graebe.[16]) $C_6 H_4 \begin{cases} COOH \\ COOH \end{cases}$.

Binitronaphthol $C_6 H (OH) (NO_2)_2 (C_4 H_4)$, produced from naphthylamine, also yields, by oxidation, phthalic acid. (Liebermann and Dittler.[17])

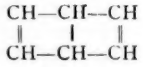
This last proof is indisputable, as it shows conclusively that no matter which half of the naphthaline ring is oxidised the same phthalic acid results. Naphthaline must therefore possess an absolutely symmetrical structure, and hence the following formulæ, proposed by Wreden, lose every support.



Berthelot,[18] and latter Ballo,[19] deduced from the formation of naphthaline from benzol or styrol and aethylene the formulæ:



The above formula explains very clearly, the corresponding syntheses and is also symmetrical but it cannot be accepted because it would give the following formula for benzol:



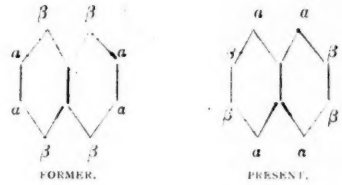
in which the six hydrogen atoms have not all the same value. The univalence of the same is positively shown from the examination of Ladenburg, Hübner and Petermann, Hubner and Wroblewsky.

ISOMERISM OF THE NAPHTHALINE DERIVATIVES.

Faraday[20] observed while investigating the sulpho-acids of naphthaline that two isomeric mono derivatives were formed. Since then an entire series of others have been discovered. Almost all of the biderivatives exist in two modifications, and the number of isomers among the higher substitution products is very numerous. The formula now used to represent naphthaline explains this fact in a very satisfactory manner.

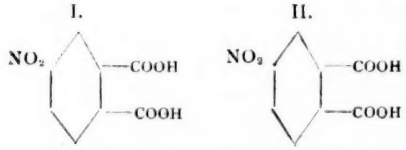
One observes, therefore, that it is not indifferent whether the hydrogen consecutive to the four combining carbon atoms are replaced or whether the four combining positions furthest removed from them, are replaced. On the other hand it is evident that the hydrogen atoms in groups of four possess equal values. In order to distinguish between these two varieties of hydrogen atoms Merz[21] has designated them by the letters *a* and *β*, and distinguishes the isomeric series as the *a* and *β* derivatives. He did not, however, state to which of the positions of the hydrogen atoms belonged the *a* and which the *β* series.

Wichelhaus,[22] soon after, forming a theory on the analogy between the *a* naphthol with phenol, assumed that the substituting hydrogen atoms were combined with the carbon atoms in both compounds alike (*i. e.* in a similar manner) and hence the *a* position must correspond to the combining place furthest removed from the carbon atoms. Especially as they are more like the benzol carbon atoms. Subsequently when it was shown that naphthachinon was an *a*—*a* derivative (Liebermann and Dittler [23]) and the para (1, 4) position of ordinary chinon was definitely settled, the notation was changed.



This demonstration is untenable however, for Stenhouse and Groves, [24] have discovered a second napththa chinon, viz.: the *β*, which likewise contains the two atoms of oxygen in the same ring; hence it follows that there are chinons which do not have their oxygen atoms in the parapposition (1, 4). Consequently the constitution of ordinary naphthachinones, as well as the position of the *a* and *β* atoms again becomes doubtful. Fortuately however other experiments, made under different conditions, permit the final answering of this question.

We have seen how Beilstein and Kurbatow [25], by the oxidation of nitronaphthaline, which is an *a* derivative, have obtained ordinary nitrophthalic acid, melting at 212°. Theoretically, there are but two isomeric nitrophthalic acids possible, both of which have been prepared.

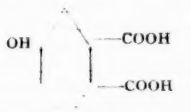


The first melts at 212°; the other, discovered by O. Miller, melts at 165°.

The latter, according to the exact researches of this investigator, corresponds to the oxyphthalic acid of Baeyer. On the other hand, Schall, [27], in the course of his researches on the hydroxylated benzoldicarbon acids, demonstrat-

[13] Loc. Cit., p. 59. Soc. Chim., Paris, XXVIII, 505, (1877).
[14] Deutsche Chem. Ges. XII, 688, (1879).
[15] Naphthylamine gives, with potassium chromate and sulphuric acid, phtalic acid and naphtachinon, (R. & N.)
[16] Private papers.
[17] Ann. Chem., CLXXXIII, 228, (1876).
[18] Ann. Chem. Pharm. CXLII, 251 (1867.) Comptes Rendus LXIII, 788 and 834.
[19] Das Naptalin und seine Derivate.
[20] Ann. Chim. Phys. XXXIV, 164.
[21] Zeitschrift für Chemie, NF. IV, 399 (1868).
[22] Ann. Chem. Pharm. CLII, 311 (1869.)
[23] Ann. Chem. CLXXXIII, 228 (1876.)
[24] Ann. Chem. Pharm. CLXXXIX, 145 (1877.)
[25] Deutsche Chem. Ges. XII, 688 (1879.)
[26] Deutsche Chem. Ges. XI, 1191 (1878.)
[27] Deutsche Chem. Ges. XII, 816 (1879.)

ed that the corresponding oxyphthalic acid has the following constitution.



Nitrophthalic acid, melting at 165°, has the second (II) formula, while the one melting at 212°, has the first (I) formula. As stated above, these are both produced from nitronaphthaline, which is itself an α compound, and so it is demonstrated that the α position is the one next to the two common carbon atoms. The hydrogen atoms in naphthaline are combined in groups of four, each of which is equivalent; this follows naturally from the observed facts in benzols.

Atterberg, in his masterly researches on the chlorinated naphthalines, found that in naphthaline, the four α positions are of equal value without any reference to the benzol formula. According to de Koninck, Marquardt and Atterberg, nitronaphthaline may be converted into α monochloronaphthaline. Therefore, in these compounds, the nitro and chloro groups hold the same position. The monochloronaphthaline may, however, be converted into a nitro compound and that into a β dichloronaphthaline. Nitronaphthaline may be converted into two different dinitronaphthalines, and those into two different dichlornaphthalines γ and ζ. Hence all three dichlornaphthalines β, γ, ζ, contain a chlorine atom in the position of the nitro group of the nitronaphthalines. The three remaining chlorine atoms of the three compounds must take different positions with reference to the first, since otherwise the three compounds could not be different. All of the chlorine atoms of these compounds possess an α position, consequently the naphthaline molecule must possess four α positions of equal value.

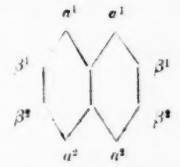
DETERMINATION OF THE CONSTITUTION OF THE NAPHTHALINE DERIVATIVES.

The constitution of naphthaline derivatives is ascertained by converting them by a simple reaction into another of known position. The nitro derivatives may, for instance, be converted into the chlorine or bromine derivatives by the chloride or bromide of phosphorus, and then by reduction into the amido derivatives. These latter may, by means of their diazo-compounds, be converted into phenols, chlorine, bromine (and perhaps iodine) derivatives, and by means of formic acid into nitriles, and consequently into carbon acids. The bromine derivatives produce, with ethyl and methyl iodide, ethyl and methyl compounds, and with chlorcarbonic acid ether carbon acids are produced. The sulpho-acids give with potassium cyanide, cyanates. With penta chloride and bromide of phosphorus, chlorine and bromine derivatives are obtained with sodium formate, carbon acids; and with sodium at a high temperature phenols are formed. On the other hand the oxidation often shows whether the substituting groups are in the same ring, or are divided among both; in the first case phthalic acid is formed, and in the second substitution products of phthalic acid are formed.

CONSTITUTION OF THE NAPHTHALINE DERIVATIVES.

The mono substitution products exist in but two modifications, and it is easy, therefore, to determine their constitution. When in the bisubstitution products, the two substituting groups are equal, ten different isomeric compounds are obtained. If, however, they are unequal, the number is increased to fourteen. The constitution of a given number of the same is exactly known, while with others it is only known that the substituting groups are contained in the same or in two different rings, that they possess an α or a β position, or a similar position.

In the case of the higher substituted naphthaline derivatives, the number of possible isomers is considerably increased, especially when the groups are unequal. When, however, the groups are equal, fourteen tri-derivatives, twenty-two tetra-derivatives, fourteen penta-derivaties, ten hexa, two hepta, and a single octo-derivative, in which all the hydrogen has been replaced, are obtained. There are, for example, seventy-five possible chlorine naphthalines; of these, however, only twenty-four have been prepared. In order to simplify the nomenclature of these numerous compounds, we will distiuguish the two from each other by designating the same position in each ing, as α^1, α^2, β^1, and β^2.



When a compound contains both of its substituting groups in the same ring, we will combine the latter after Jolin's method, that is, by a simple line, as for example, α_1-β^1, α^1-β^2, α^1-α^2, etc. When, however, the groups are divided between the two rings, then they are combined by double lines, thus: $\alpha^1=\alpha^1$, $\alpha^1=\beta^1$, $\alpha^1=\beta^2$, etc. The same method of lettering may be used in the higher substituted compounds; thus the compounds $\alpha^1-\beta^1-\alpha^2$, $\alpha^1-\beta^2-\alpha^2$, $\alpha^1-\beta^1-\beta^2-\alpha^2$, have their groups in the same ring. The compounds $\alpha^1-\alpha^2=\alpha^1$, $\alpha^1-\alpha^2=\beta^1$, $\alpha^1=\alpha^1-\alpha^2$, $\alpha^1-\alpha^2=\alpha^1-\beta^1$, have their groups divided between the two rings. We have placed together, in a series of tables, the most important derivatives of naphthaline. In these tables will be found their constitution as far as it is known; some characteristic properties, as their melting point, boiling point, their formation, conversion, and, as complete as possible, a list of the literature.

It is to be hoped that the many vacancies which appear among these tables may soon be filled.

Last of all we would observe that the terms α, β, γ, δ, etc., which we have chosen to represent the naphthaline derivatives have no connection with their constitution with the single exception of the mono derivative. They have been given to the different isomers only in chronological order, and they do not correspond by any means as far as position is concerned to the different α, β, etc., derivatives. This fact is unfortunate, because it may cause confusion. We believe, however, that at present no change should be made in names originally chosen by the discoverers. When the constitution of the napthaline derivatives is better known, a rational nomenclature according to the above principals will naturally be adopted. Thus for instance the present β, γ and ξ dichlornaphthalines will be designated as α^1—α^2, $\alpha^1=\alpha^2$ and $\alpha^1=\alpha^1$ dichlornaphthaline, the α and δ trichlornaphthaline as α^1—β^1—β^2 and α^1—$\alpha^2=\alpha^1$, trichlornaphthaline, the α and β chlorodinitronaphthalines as α^1—$\alpha^2=\alpha^1$ and α^1—$\alpha^2=\alpha^2$ chlorodinitronaphthalines, and in a similar manner for all other compounds by which their constitution will be immediately recognized.

NATIONAL ACADEMY OF SCIENCES.

The abstracts of the papers read before the recent meeting at New York were, in all cases, either corrected or rewritten by the authors, and we are under obligation to Professors James Hall, Wolcott Gibbs, E. D. Cope, S. P. Langley, Henry Morton, Elias Loomis, B. Silliman, O. N. Rood, T. Sterry Hunt, Henry Draper, for their assistance in presenting correct reports.

The addresses of Professor Alexander Agassiz and Lieut. Shawatka were delivered *viva voce*, and we made use of the stenographic notes made for the New York

Tribune in these cases, which were submitted to the authors on the 4th of December last for correction or rejection; no objection being made we printed them in a recent number. After publication Professor Agassiz now writes that the reports under his name are not satisfactory to him. We therefore request our readers to consider them withdrawn.

Professor George F. Barker, Professor O. C. Marsh and Professor J. E. Hilgard are preparing more elaborate reports of their important papers, and promise them at an early day.

THE BRAIN OF THE ORANG.*

BY HENRY C. CHAPMAN, M.D.

The brain of the Orang has been figured by Tiedemann, Sandifort, Schroeder van der Kolk and Vrolik, Gratiolet, Rolleston, etc. On account, however, of the few illustrations extant, and of the importance of the subject, I avail myself of the opportunity of presenting several views of my Orang's brain (Figs. 1 to 5), which was removed from the skull only a few hours after death. The membranes were in a high state of congestion, and a little of the surface of the left hemisphere had been disorganized by disease, otherwise the brain was in good condition. It weighed exactly ten ounces. The brain of the Orang in its general contour resembled that of man more than those of either of the Chimpanzees which I examined. In these the brain was more elongated. The general character of the folds and fissures in

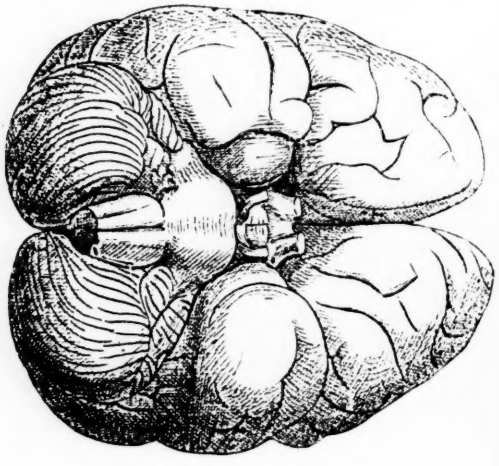


FIG. 1.

the brain of the Orang, Chimpanzee, and man are the same; there are certain minor differences, however, in their disposition in all three. The fissure of Sylvius in the Orang runs up and down the posterior branch pursuing only a slightly backward direction; the anterior branch is small. The fissure of Rolando, or central fissure, quite apparent, is, however, situated slightly more forward in the Orang than in man. It differentiates the frontal from the parietal lobe. The parieto-occipital fispure is well marked; bordered externally by the first occipital fold it descends internally on the mesial side of the hemisphere, separating the parietal from the occipal lobes. In the Orang, the parieto-occipital fissure does not reach the calcarine, being separated from it by the "deuxième plis de passage interne" of Gratiolet, or "untere innere Scheitelbogen-Windung" of Bischoff. I have noticed this separation as an anomaly more than once in man.

According to Bischoff, this disposition obtains in the Gorilla, and seems to be usual also in the Chimpanzee. In the female Chimpanzee, however, on the left side I found the parieto-occipital fissure passing into the calcarine, as in man. The frontal lobe is easily distinguished from the parietal by the fissure of Rolando, and from the temporal by the fissure of Sylvius. In the Orang it is higher, wider, and more arched than in the Chimpanzee. The anterior central convolution in front of the central fissure runs into the post-central convolution above and below, as in man. It is difficult, however, to identify the three frontal convolutions seen in man and the Chimpanzee, the frontal lobe of the Orang dividing rather into two convolutions, the middle one being badly defined. This is due somewhat to the length of the precentral fissure, which is as long as the fissure of Rolando, extending farther upward than in man. There was nothing particularly noticeable about the base of the frontal lobe; on the mesial surface it ran into the parietal. The part above the calloso-marginal fissure in the Orang is not as distinctly divided into convolutions as in man, though these are not constantly present even in all human brains. The parietal lobe is separated from the frontal by the central fissure, from the occipital and temporal incompletely, by the parieto-occipital and Sylvian fissures. The posterior-central convolution is well defined. The parietal fissure in the Orang is more striking than that of man, resembling the Gorilla's; it is twice as long as the corresponding fissure in the Chimpanzee, extending from the transverse occipital fissure, as is sometimes the case in man, almost into the fissure of Rolando. It is unbridged and without a break, and divides the parietal lobe completely into upper and lower parietal lobules. The upper parietal lobule is bounded externally by the parietal fissure; posteriorly it is separated from the occipital lobe, internally by the parieto-

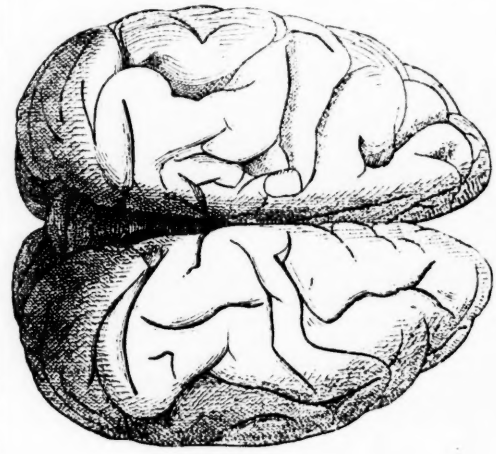


FIG. 2.

occipital fissure; externally it is continuous with the occipital lobe, as the first occipital gyrus, anteriorly it is separated from the posterior central convolution more completely than in man, by a fissure which runs parallel with the central fissure. There is in the Orang, also, a fissure running parallel with the parietal, which subdivides the upper parietal lobule into inner and outer portions. The precuneus, or the space on the mesial side of the parietal lobe between the parieto-occipital

* From the Proceedings of the Academy of Natural Sciences, Phila., 1880.

fissures and the ascending branches of the callosomarginal, is well defined. The lower parietal lobule in the Orang divides naturally into the supra-marginal and angular gyri. The supra-marginal fold curves around the upper end of the posterior branch of the fissure of Sylvius and runs into the superior temporal gyrus. The angular gyrus, which is very evident, arches around the first temporal fissure, and becoming continuous with the second occipital fold, passes then into the upper temporal

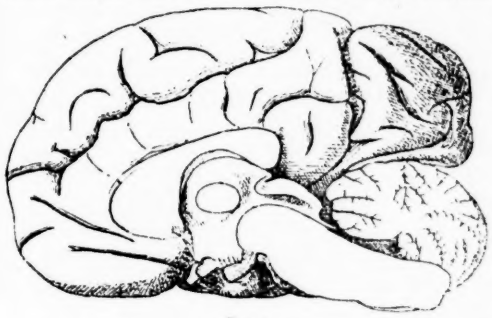


FIG. 3.

gyrus. The occipital lobe, separated from the parietal, internally, by the parieto-occipital fissure, is continuous with the upper parietal lobule through the first occipital gyrus, and by the second occipital gyrus with the angular. There are no sharp lines of demarcation between the occipital and temporal lobes. In the occipital lobe of my Orang the transverse occipital fissure was present, and received the parietal fissure. The calcarine fissure was well marked, but was separated in the Orang from the parieto-occipital fissure by the "deuxième plis de passage interne" of Gratiolet, the "untere innere Scheitelbogen-Windung" of Bischoff. The cuneus of the Orang is therefore somewhat different from that of man. In man I have seen these two fissures separated as an anomaly. The calcarine passed into the hippocampal fissure, so that in the Orang, as in monkeys generally, the gyrus fornicatus was separated from the hippocampal gyrus, whereas in man these convolutions are continuous. This disposition has been noticed in the Hylobates, in Ateles, and in one Chimpanzee, where the calcarine did not reach the hippocampal. The first occipital gyrus is very well developed, and as the late Professor Gratiolet observed, is one of the most striking convolutions

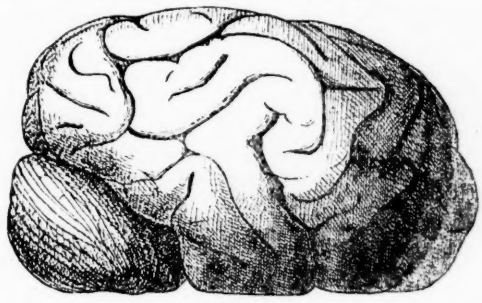


FIG. 4.

in the brain of the Orang. It rises so to the surface that the internal perpendicular fissure or external part of the parieto-occipital fissure is almost entirely bridged over, the operculum so characteristic of the monkey almost disappearing. It is continuous with the upper parietal lobule arching around the parieto-occipital fissure. This convolution comes to the surface in the Hylobates and Ateles almost to the same extent as in the Orang, but it is more developed in the latter than in the Chimpanzee. It is called also the "premier plis de passage externe," by Gratiolet, the "obere innere Scheitelbogen-Windung," by Bischoff, the "first annectant gyrus," by Huxley, and "first bridging convolution," by Turner. The second occipital convolution connects the occipital lobe with the angular gyrus. In my Orang it was partly concealed by the first occipital. It was not as superficial as in man, The third occipital gyrus is continuous with that part of the temporal lobe below the first temporal fissure. I noticed, also, in my Orang the "quatrième plis de passage" of Gratiolet. On the mesial side of the occipital lobe in my Orang was well seen the "deuxième plis de passage interne" of Gratiolet, the "untere innere Scheitelbogen-Windung" of Bischoff, which separates the calcarine from the parieto-occipital fissure; and in both the Orang and Chimpanzee, more especially on the left side, I had no difficulty in recognizing the "premier plis de passage interne" of Gratiolet, its convexity turning inwards, while that of the first occipital gyrus, or the "premier plis de passage externe," turns outward. These two convolutions, the first occipital gyrus and the "premier plis de passage interne," in my Orang were continuous. They are regarded as one by Bischoff, forming his "obere innere Scheitelbogen-Windung," but as two by Gratiolet, constituting his "premier plis de passage externe et interne."

The temporal lobe in the Orang is much less convoluted than in man, or even in the Chimpanzee. The first temporal fissure and first temporal convolution are well marked, but the second and third are badly defined

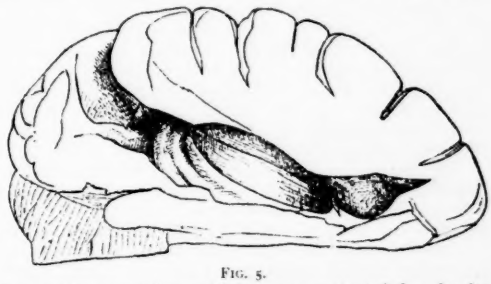


FIG. 5.

The fusiform and lingual lobes are separated by the inferior occipito-temporal fissures, the collateral fissures of Huxley. The Island of Reil was perfectly covered in both the Chimpanzee and the Orang by the operculum, but was not convoluted in my Orang. The surface in places was slightly roughened. I noticed, however, three or four convolutions in the Chimpanzee. On making a section of the left hemisphere of the Orang I noticed that the corpus callosum was relatively smaller than in man, but that the ventricle exhibited an anterior, middle and posterior cornu, the corpus striatum, tænia semicircularis, thalamus opticus and fornix were well developed, the hippocampus major with corpus fimbriatum were perfectly evident, and the hippocampus minor larger relatively than in man. I did not see a trace of the emmenentia collateralis; this is often, however, absent in man.

The cerebellum in my Orang was relatively larger than that of man, but smaller than that of either of the Chimpanzees I have dissected, and was just covered and no more by the posterior lobes of the cerebrum. This relation is still retained in my Orang, though the brain has been lying in alcohol for three months since it was taken out of the chloride of zinc in which it was placed until the pia mater could be removed. During this period it has been subject to the conditions, such as the want of the support of the membranes, the effect of pressure, etc., urged by Gratiolet, Huxley, Rolleston, Marshall, etc., as sufficient to explain why after death the cerebellum is uncovered by the cerebrum in the Orang and Chimpanzee, as held by Owen, Schroder van der Kolk and Vrolik, and Bischoff. Every anatomist knows that

the brain, after removal from the skull, especially without the membrane, if left to itself, very soon loses its shape. It is absolutely necessary therefore to examine the brain *in situ*, and after removal from skull to place it in some hardening fluid in which it will float. Even with these precautions, through the change of the surroundings, shrinkage, etc., the brain is always somewhat altered. It happens, however, that I have had lying in alcohol for some years a number of human and monkey brains. Among the latter, examples of the genera *Cebus, Ateles, Macacus, Cynocephalus, Cercopithecus*, etc., taken out of the skull sufficiently carefully, but preserved in the rudest manner without any regard to the above precautions. Now, while all of these brains have somewhat lost their natural contour, they are not so changed that in a single one, human or monkey, do I find the cerebellum uncovered by the cerebrum, and in every instance the posterior lobes overlap the cerebellum to a greater extent than I find is the case in my Orang. If the cerebrum and cerebellum in the Orang and Chimpanzee invariably bear the same proportion to each other as they do in man and the monkeys, why should not the brain of an Orang or Chimpanzee, after lying in alcohol for some years, exhibit the cerebellum covered by the cerebrum as in them? Why should it be necessary to replace the brain of the Chimpanzee or the Orang in the skull, to make plaster casts, etc., if there is no difference between their brains and those of man and the monkeys, for there is no necessity of having recourse to such measures to prove that the cerebellum is covered in the latter?

In the account I gave of the female Chimpanzee,[1] I stated that I found the cerebellum uncovered. I had the opportunity a short time since, of verifying that statement in the male, noticing *in situ* that the cerebellum was uncovered by the posterior lobes. This was found to be the case by Mr. Arthur Browne, the Superintendent of the Phila. Zool. Garden, in a third Chimpanzee which died there. With all deference to Prof. Marshall's[2] photograph of a plaster cast of the brain of a Chimpanzee, and however it may truthfully represent the relations of the cerebellum in his specimen, I must say that it would be simply monstrous if accepted as an illustration of either of mine, and with profound respect for Prof. Huxley's[3] opinion regarding the interior of the skull being a guide for the determination of the proportion between posterior lobe and cerebellum, I find it anything but a safe one as regards the anthropoid apes. For the space between posterior lobes of brain and dura mater and bone, both posteriorly and laterally, I find variable *in situ*, due to the state of the blood vessels and amount of fluid in arachnoid and subarachnoid cavities. In speaking of the Gorilla, Prof. Bischoff[4] observes, p. 100, "Das es bei ersterem am wenigsten von oben Hinterlappen der grossen Hemisphäre bedeckt wird und bei der Betrachtung des Schädel gewiss von oben mit seinem hinterem Rande sichtbar wird." And in reference to the Chimpanzee,[5] p. 95, "Die Hinterhauptslappen des grossen Gehirns bei diesem Affen wie bei dem Menschen das kleine Gehirn überzogen und von oben fast ganz bedecken." And Vrolik[6] states, p. 7, of the Orang: "Ce lobe postèrieur ne se prolonge pas autant que chez l'homme; il ne recourve pas si bien le cervelet du moins il ne cache pas complétement surtout vers les côtés." The fact of the cerebellum being covered by the posterior lobes in my Orang and that figured by Gratiolet, and but slightly uncovered in that of Vrolik's, is no more strange than that Bischoff[7] should find it covered in one Hylobates, and Prof. Huxley[8] having stated it to be uncovered in another.

[1] Proceedings of the Acad. Nat. Sciences, Phila., 1879.
[2] Natural History Review, 1861.
[3] Man's Place in Nature, p. 97.
[4] Das Gehirn des Gorillas, 1877.
[5] Gehirn des Chimpanzee, 1871.
[6] Amsterdam Verslagen, Deel, 13, 1862.
[7] Beitrage zur Hylobates, 1860.
[8] Vertebrate Anatomy, p. 411.

CAUSES WHICH DETERMINE THE PROGRESSIVE MOVEMENT OF STORMS.*

PROF. ELIAS LOOMIS.

For the purpose of discovering the causes which determine the progressive movement of storms, I have made an extensive examination of the course and velocity of storm centres in tropical regions, and also of abnormal paths in the middle latitudes of Europe and America. I have examined the courses of all those hurricanes which have originated near the West India Islands, and also all the storm tracks delineated on the maps of the *Monthly Weather Review*. I have examined the courses of all those hurricanes in Southern Asia and its vicinity whose paths have been best determined, and also all the storm tracks delineated on the maps of the International Series of Observation. The following summary presents some of the results derived from this investigation.

1. The lowest latitude in which a cyclone centre has been found near the West India Islands is ten degrees; and the lowest latitude in the neighborhood of Southern Asia is six degrees. Violent squalls and fresh gales of wind have, however, been encountered directly under the equator.

2. The ordinary course of tropical hurricanes is toward the west-northwest. In a few cases they seem to have advanced toward a point a little south of west, and in a few cases their course has been almost exactly toward the north.

3. Tropical hurricanes are invariably accompanied by a violent fall of rain. This rain fall is never less than five inches in twenty-four hours for a portion of the track, and frequently it exceeds ten inches in twenty-four hours.

4. Tropical storms are generally preceded by a northerly wind, and after the passage of the low centre, the wind generally veers to the southeast at stations near the centre, and the southerly wind which follows the low centre is generally stronger than the northerly wind which preceded it. This fact appears to suggest the explanation of the origin of the cyclone, and the direction of its progressive movement. The prevalent direction of the wind in the neighborhood of the West India Islands is from the northeast. Occasionally a strong wind sets in from a southerly quarter. The interference of these winds gives rise to a gyration, and a fall of rain sometimes results. When rain begins the latent heat which is liberated causes an inflow of wind from all quarters, by which the rainfall is increased; and since the winds are deflected by the rotation of the earth, an area of low pressure is produced, and the force of the winds will be maintained as long as the rainfall continues. The effect of this strong wind from the south is to transport the low centre in a northerly direction; and by the combined action of this south wind and the normal wind from the northeast the centre of low pressure is usually carried in a direction between the north and west.

The electrical blowpipe of M. Jamin consists of a pair of carbon pencils—an electric candle, in fact—surrounded by a coil of insulated copper wire wound a few inches distant from the pencils in the plane of their axes. The current is so led that, in circulating round the coil, it will attract the electric arc formed at the lower end of the carbon pencils, and cause it to flash out almost in the form of a fish-tail gas flame. This spreading out of the arc is the special feature of the action of the apparatus. It facilities the application of the heat of the electric arc to the fusion of refractory substances, and enables us better to take advantage of this little-used means of producing a very high temperature.

* Read before the A. A. A. S., Boston, 1880.

LETTERS TO THE EDITOR.

[The Editor does not hold himself responsible for opinions expressed by his correspondents. No notice is taken of anonymous communications.]

To the Editor of SCIENCE:

I was much pleased to see, by an abstract in "SCIENCE," that the opportunity which Philadelphia scientists had of examining into the anatomical peculiarities of the Orang-Outang was utilized, and that the body of the anthropoid, deceased in the Philadelphia Zoological Gardens, fell into the hands of as zealous an anatomist as Dr. Chapman. I have since had access to the original paper*, and would provisionally offer a few comments upon such statements as Dr. Chapman makes with reference to the cerebral relations of his anthropoid specimen.

It is stated that the brain of this Orang resembles that of a man more, as regards its general contour, than that of either of the Chimpanzees which the Dr. examined. It must be borne in mind that the internal dimensions of the cranial cavity of both anthropoid species show a relative excess of the transverse diameter as compared with the average mesocephalic human skull. But the correlated greater breadth of the brain is not due to a general greater breadth of all the lobes, for it is mainly provided for by the immense reduction in mass, and in every dimension of the frontal lobe. If the frontal lobe were relatively as well developed in the anthropoid apes as in man, the general contour of the cerebral hemispheres would be nearly the same in all three species, but more human in the Chimpanzee than in the Orang. Many of the inferences of the writer regarding contours and relations, seem to be based on the hardened and otherwise manipulated specimen, and for reasons which I shall advance are probably faulty. It is further stated, that the fissure of Sylvius runs up and down, "the posterior branch pursuing only a slightly backward direction." On looking at the accompanying plate (Pl. xvii, Fig. 1.),† I perceive the reason for this statement. The Doctor's specimen had been allowed, evidently, to flatten out on its base, for the lower contour of the frontal and temporal lobes as well as of the cerebellum is an accurate straight line. Under such circumstances the fissures must change their natural direction. In both hemispheres of my Orang, the inclination of the Sylvian fissure (horizontal branch) is thirty degrees towards the ideal hemispheral axis. It is owing to the same imperfect manipulation that the author has arrived at the conclusion that the central fissure (Rolando's) is more forward in the Orang than in the other anthropoid. According to some recent writers ‡ on the convolutions, the acuteness of the angle formed by the central fissure and the median fissure separating the hemispheres, forward is an index of cerebral development. It is acuter in both my Chimpanzee brains, then in the Orang in my possession or in any of those figured in plates.

I find the temporal lobe in my Orang well convoluted, showing the same sulci and in about the same degree of complexity as other anthropoid brains.

Dr. Chapman's figures give but a poor idea of the richness in gyri and the proportions of the different parts of the Orang's brain, at least as these are observable in the specimen which I demonstrated before the New York Academy of Sciences. In figure 2 § the frontal lobes are too broad and too long, and the ethmoidal prolongation (*Sieb-bein-schnabel*) is not indicated anywhere. Some of the sulci drawn are not identifiable in any brain that I have seen a record of, and others which are recorded as constant can not be identified at all. It is not difficult to see from the drawings that the cerebral hemispheres were permitted to separate, the whole brain to flatten on its inferior surface, and that no successful attempt was made to retain the natural proportions of any of the parts.

I would add that my observation on the Island of Reil, in the Orang, is distinctly contradictory of that of Dr. Chapman, who states it to be unconvoluted. One of the hemispheres in my possession is so prepared as to show the sulci and *gyri breves* of the Orang's *insula*, which correspond as to their direction and relations to, though less numerous and well marked than, those of man. In every anthropoid dissected by myself I find these gyri and sulci, and one sulcus, is a constant feature of even the Cynocephali. Dr. Chapman has, on a former occasion, asserted the cerebellum to be uncovered by the cerebrum in one of his Chimpanzees. I examined carefully both specimens that were sent to Philadelphia, and of which the Doctor obtained the brains after death. They did not differ in their external cranial configuration from the other Chimpanzees; they were the healthiest, most active, and most intelligent of the species I have seen, and considering the fact that in both of my specimens the cerebrum clearly overlapped, I was much surprised to find that Dr. Chapman had discovered an exception in one of the two animals* I had myself seen. Subsequently Doctor Parker demonstrated that Doctor Chapman's observation was due to the imperfection of the methods followed. That the writer made erroneous inferences is clear from a statement in the very paper I am now commenting on. Dr. Chapman says, "It happens, "however, that I have lying in alcohol for some years a "number of human and animal brains. Among the latter, "examples of the genera *Cebus, Ateles, Macacus, Cyno-* "*cephalus, Cercopithecus*, etc., taken out of the skull sufficiently carefully, but preserved in the rudest manner "without any regard to the above precautions. Now, "while all of these brains have somewhat lost their "natural contour, they are not so changed that in a single "one, human or monkey, do I find the cerebellum uncovered by the cerebrum, and in every instance the posterior lobes overlap the cerebellum to a greater extent "than I find is the case in my Orang. If the cerebrum "and cerebellum in the Orang and Chimpanzee invariably bear the same proportion to each other as they do "in man and the monkeys, why should not the brain of "an Orang or Chimpanzee, after lying in alcohol for some "years, exhibit the cerebellum covered by the cerebrum "as in them? Why should it be necessary to replace the "brain of the Chimpanzee or the Orang in the skull to "make plaster casts, etc., if there is no difference between "their brains and those of man and the monkeys, for "there is no necessity of having recourse to such measures to prove that the cerebellum is covered in the "latter?"

The above would be, to say the very least, a novel kind of argumentation, even if its assumptions were true. I have seen hundreds of brains taken out of the skull on *post mortems* of the human subject thrown on a slab, which would, if preserved (and in instances where they were preserved *did*), show an uncovered cerebellum. Why, Benedict of Vienna actually discovered that the cerebellum was uncovered in several criminals! This discovery was speedily exposed as a crude fallacy by Meynert and Heschl. It is remarkable that Dr. Chapman disposes with such facility, of the exact methods and relies so much on proofs which are, so to speak, the outgrowth of accident. Now, in every instance where the

* On the structure of the Orang-Outang by Henry C. Chapman, M. D. Proceedings of the Academy of Natural Sciences of Philadelphia, 1880, p. 160.

† See page 326 of this Journal, Fig. 2.

‡ Meynert Archiv für Psychiatrie VII. Clevenger, "The sulcus of Rolando an indication of intelligence" *Journal of Nervous and Mental Diseases*, 1880.

§ See page 326 of this Journal, Fig. 1.

* One of these was the black-faced variety which Du Chaillu attempted to make an extra species of (Not the *Tschego.*)

brain of the Gorilla, Chimpanzee and Orang has been carefully studied in place, and where measurements of the brain have been controlled by measurements of the cranial capacity and relations—in short, wherever the best and only reliable methods have been employed, the cerebellum has been found covered by the cerebrum. My own observations are the following: 1st. The dissection of an infant Chimpanzee (two years) and the study of the relations in the fresh state in presence of several professors of anatomy at the New York Medical Schools, as well as of neurologists. I need instance but two eye-witnesses, Professors Wm. H. Darling and Wm. A. Hammond. 2d. The dissection of a large Chimpanzee (probably nine years old) and the verifying of the complete concealment of the cerebellum in the fresh specimen, in presence of Professor Herman Dorner, Ph. D., and several of my class in comparative anatomy. The hardened brain shows the same relation as it did in the fresh state. 3d. The cast of the skull of a Chimpanzee which I purchased many years ago. 4th. The examination of another out of which the brain had been removed by a coroner (!) at Coney Island.

As regards my Orang Outang I would say that in the median line the cerebellum was markedly overlapped, but that towards the sides its margin coincided with that of the cerebral edge. This is due to the altogether different shape of the Orang's cerebellum as contrasted with that of the Chimpanzee. Its lateral lobes flare out and do not taper like the human and troglodyte cerebellum.

In conclusion, I would say that I have observed a fifth ventricle (*ventriculus septi pellucidi*) in the Orang and Chimpanzee. I should be much interested to know whether Dr. Chapman has examined into this point and whether he confirms my observation or not. Judging from the photograph of the medial surface of a Gorilla's hemisphere in Pausch's monograph, I believe this species to correspond to other anthropoid apes in this regard.

The olivary nucleus is far richer in crenulations and mass in the Orang than in the Chimpanzee.

E. C. SPITZKA, M.D.

130 East 50th Street, Dec. 22, 1880.

To the Editor of SCIENCE:

For some years past I have been a strong believer in the anatomical uses of the cat as a standard of comparison for other vertebrates. I am persuaded, as the result of experience and observation, that the cat is a valuable and convenient subject of preliminary dissection by the human anatomist. I have often desired a description of the muscles in a cheaper and more convenient form than the ponderous quarto of Straus-Durckheim.

The forthcoming "Laboratory Manual," by Professors Wilder and Gage, of Cornell University, will contain detailed descriptions of the muscles of the neck and the arm, with explicit directions for the exposure and the dissection of each in its natural order. A most desirable feature of the manual is the Synonomy and General Description of the muscles.

This manual has been prepared by practical instructors and is not a mere compilation. At the request of Dr. Wilder, I have recently made some dissections for the sake of verifying the accuracy of these descriptions, as given in the advanced sheets printed for the students in his laboratory, and I am informed that duplicate sets of these sheets may be obtained, at a nominal price, by others who will engage to return the extra copy with criticisms and suggestions which may aid the authors in making the work more accurate and complete.

T. B. STOWELL.

STATE NORMAL SCHOOL, CORTLAND, N. Y.,
December 22, 1880.

ASTRONOMY.

THE TEMPEL-SWIFT COMET.

Professor Frisby, of the Naval Observatory, has computed from the Washington observations of October 25, November 7, and November 20, an orbit of the comet discovered by Mr. Swift on October 10, without assuming a value of the eccentricity or of the period, and finds an elliptic orbit with a periodic time of a little less than six years. The observations used in this calculation are too near together to give a good determination of the periodic time, but the probability is that this comet has made two revolutions around the sun since its discovery by Mr. Tempel in 1869, and that its true period is nearly 5½ years. The perihelion distance found by Professor Frisby is 1069; and the aphelion distance is 5472. Thus one of these distances corresponds very nearly to the earth's distance from the sun, and the other to that of Jupiter.

This comet was observed at Washington on December 22 and 24, and data are at hand, therefore, for a more exact determination of the orbit. Since December 24 the sky has been cloudy. A. HALL.

WASHINGTON, *December* 29, 1880.

COMET DISCOVERED.

The Smithsonian Institution has received from the Astronomer Royal, of England, the announcement of the discovery by Cooper on December 21, at nine o'clock P. M., Greenwich mean time, of a bright comet in 1 hour 5 minutes right ascension and 6 degrees north declination, which, at seven o'clock, December 25, was in 1 hour 29 minutes right ascension and 2 degrees north declination.

WASHINGTON, *Dec.* 28, 1880.

ALVAN CLARK & SONS, of Cambridgeport, have now on hand, in all the various stages of completion, a most interesting collection of large refractors, to say nothing of a number of glasses of 8 inches or less diameter.

The lenses of the 23-inch equatorial for Prof. Young, at Princeton, are receiving the finishing touches, and have already shown a remarkable degree of perfection. The glass was cast by Feil. The mounting for this instrument is well advanced.

A 16-inch objective for Prof. Swift, of the Warner Observatory, is finished, and the mounting nearly so. This glass is of English manufacture.

The McCormick glass of 26 inches aperture, made at the same time as the Washington Refractor, and intended for the University of Virginia, is still in the shop and has been completed for several years, while the mounting requires but comparatively little additional work.

Two 8-inch refractors have been ordered and are partially finished,—one ordered by Prof. Young for the seminary at South Hadley, and the other by Dr. Engelmann, of Leipsic.

The flint glass disc for the 30-inch telescope, ordered by Struve for the Russian Government, has been received from Feil, and the crown glass is expected shortly. The mounting for this will probably be made abroad.

For the Lick Trustees a 36-inch refractor is ordered, but will not be completed for several years.

A 12-inch equatorial for observing the transit of Venus is nearly finished, and orders have been received for a 5-inch photoheliograph and a smaller comet-seeker.

In all or nearly all of these instruments the cell of the object glass is arranged so as to separate the lenses by several inches and allow a free circulation of air between them, as well as to afford an opportunity of readily reaching the inner surfaces of the glass. In the larger objectives especially, such a device is required in order to bring the temperature of the glass as nearly as possible equal to that of the external air. W. C. W.

To the Editor of "SCIENCE."

In view of Mr. A. N. Skinner's criticism of my attempted correction of certain dates of Prof. Watson's discoveries as given in "SCIENCE," p. 283, it seems perhaps due to all concerned to state how my note, p. 305, originated. Having occasion to learn the full extent of Prof. Watson's discoveries, I noticed that those of the dates given on p. 283 did not correspond with dates in Prof. Watson's own announcements of discoveries bearing the same serial numbers; and that Prof. Watson made no corrections of these announcements in the Journal which contains them. As the list, p. 283, was "compiled by the aid of the list of Minor Planets published by Mr. A. N. Skinner," in *Am. Jour. Sci.* III., xviii, and Mr. Skinner's list gives no dates, the inference was unavoidable that the dates were supplied by the compiler. Assuming this to be the editor, I noted down the discrepancies observed, sent the memorandum to the editor for his private use, and proceeded with my business. Had I been led to infer that the dates had been communicated from Washington, I should have exercised more caution. In any event, my memorandum was intended simply as a suggestion to the editor to re-examine the records; and it did not contain any reference to "your correspondent." Still more unfortunately, after deciding to publish my note, a change was made from "Aug. 16" to "Aug. 14," and this typographical error is one of the wrong dates which attracts Mr. Skinner's attention.

These misunderstandings have arisen from using my memorandum more conspicuously than was intended; and yet as it was not marked "private" or "personal," it cannot be insinuated that such use was unwarranted.

ALEXANDER WINCHELL.

UNIVERSITY OF MICHIGAN, ANN ARBOR, Dec. 27, 1880.

[NOTE.—We would remind Professor Winchell that the Astronomical Note which he attributed to the editor was signed, and dated from Washington, D. C. As to Professor Winchell's first letter, if it had been addressed personally to the editor, he would have been justified in using some discretion in regard to its publication, but a short note addressed to the "Editor of SCIENCE," directing attention to supposed errors in a previous number, seemed to demand immediate publication.

The suppression of the letter might have been interpreted adversely to the spirit in which this Journal is conducted, and as not conceding that respect for Professor Winchell's communications which is universally accorded in all scientific circles.

We think Professor Winchell has nothing to regret in writing the letter in question; the dates on which Professor Watson discovered the planets referred to, had clearly been mis-stated in several journals usually credited with exactness of statement. Professor Winchell's communication has directed attention to this fact, and we are glad that the correspondent who favors us with astronomical notes has been successful in correcting these errors in such a manner, and that their repetition is not probable in the future.—Ed.]

Prof. R. S. Ball, the Astronomer Royal for Ireland, delivered, recently, two lectures on the Life and Work of Sir W. Herschel, under the auspices of the Edinburgh Philosophical Institution. With the aid of large diagrams and the limelight he made his large audience conversant with the means adopted by Herschel in making his discoveries, and thoroughly impressed them with the magnitude of the labor. Speaking of Herschel's discovery that the sun was rapidly moving towards a point in the constellation Hercules, Prof. Ball said that at the end of the lecture his audience would be 5000 miles nearer to it than they were at the beginning.

THE ROYAL SOCIETY.

The following is the list of Officers and Council for the ensuing year:—

President—William Spottiswoode, M. A., D. C. L., LL. D.

Treasurer—John Evans, D. C. L., LL.D.

Secretaries—Professor George Gabriel Stoke, M. A., D. C. L., LL.D.; Professor Thomas Henry Huxley, LL.D.

Foreign Secretary—Professor Alexander William Williamson, Ph. D.

Other Members of the Council—William Henry Barlow, President, Inst. C. E; Rev. Professor Thomas George Bonney, M. A., Secretary, G. S.; George Busk, F. L. S.; Right Hon. Sir Richard Asheton Cross, G. C. B.; Edwin Dunkin, V. P. R. A. S.; Alexander John Ellis, B. A.; Thomas Archer Hirst, Ph. D.; William Huggins, D. C. L., LL.D.; Professor John Marshall, F. R. C. S.; Professor Daniel Oliver, F. L. S.; Professor Alfred Newton, M. A., President C. P. S.; Professor William Odling, M. B., V.-P. C. S.; Henry Tibbats Stainton, F. G. S.; Sir James Paget, Bart., D. C. L.; William Henry Perkin, Secretary C. S.; Lieut.-Gen. Richard Strachey, R. E., C. S. I.

CHEMICAL NOTES.

CHEMICAL CONSTITUENTS OF *Stereocaulon Vesuvianum*.—The question has been raised whether the succinic acid obtained from this lichen is a product of the decomposition of atranoric acid, which, however, on treatment with baryta, furnishes a product totally different.

DETECTION OF HONEY WITH STARCH-SUGAR.—A. Planta determines the grape-sugar present in honey before and after inversion. In pure honey the proportion of pre-existing grape-sugar is from 63 to 71, whilst in samples it is 29 to 37. But the starch-sugars of commerce contain a much higher proportion of pure grape-sugar than he assumes.

COLORIMETRIC DETERMINATION OF CHLORINE IN POTASSIUM BROMIDE.—One grm. potassium bromide is ground to a powder with an approximately equal quantity of potassium bichromate, placed in a flask holding 100 c.c. and covered with 5 c.c. concentrated sulphuric acid. The flask is then connected air-tight, by means of an adaptor ground to fit its mouth, with a receiver containing 100 c.c. very dilute ammonia (5 or 6 drops of caustic ammonia to 100 c.c. of water). A gentle heat is applied and raised to about 128°, There should be two large bulbs blown on the connection tube to prevent the reflux of the liquid. When all the chlorine has thus been expelled, the distillate is compared with solutions of ammonium chromate of known strength prepared for the purpose. C. ROTH.

SIMPLE METHOD FOR DETERMINING THE TEMPORARY HARDNESS OF WATER.—The most accurate method is to titrate at the boiling point, in a silver capsule with normal hydrochloric acid, using as indicator a solution of alizarin or extract of logwood. As a more convenient method when travelling, &c., A. Wartha uses a tube 30 to 40 c.m. in length, closed and rounded at one end, and with a lower mark showing 10 c.c. From this mark, upwards towards the mouth, the tube is graduated in 0.1 of a c.c. For use, the tube is filled up to the lowest mark with the water in question and a little piece of filter-paper is added which has been previously saturated with extract of logwood and dried again. This gives the water a violet color. Centinormal hydrochloric acid is then added from a dropping bottle till the color of the liquid approaches an orange. The tube is then closed with the thumb and well shaken. Carbonic acid escapes and the liquid grows red again. Acid is again added, and the tube is again shaken till a single drop of acid changes the color of the liquid to a pure lemon yellow. The quantity of centinormal acid used is then read off on the graduated tube, and can be calculated into calcium carbonate.

BOOKS RECEIVED.

PROCEEDINGS OF THE ACADEMY OF NATURAL SCIENCES OF PHILADELPHIA, PART II.—April to September, 1880.—Edited by EDWARD J. NOLAN, M.D., Philadelphia, 1880.

The present volume contains the following papers:

Carcinological Notes, No. II.—Revision of the Gelasimi. (Continued), by J. S. Kingsley.

Remarks on Pond Life, by Jos. Leidy, M. D.

On the Structure of the Orang Outang, by H. C. Chapman, M. D.

Description of a New Crustacean from the Upper Silurian of Georgia, with remarks upon Calymene Clintoni, by Anthony W. Vogdes.

Carcinological Notes, No. III.—Revision of the Genus Ocypoda, by J. S. Kingsley.

Carcinological Notes, No. IV.—Synopsis of the Grapsidæ, by J. S. Kingsley.

Serpentine Belts of Radnor Township, Delaware Co., by Theodore D. Rand.

On some Homologies in Bunodont Dentition, by Harrison Allen, M. D.

Description of a Partula supposed to be new, from the Island of Moorea, by W. D. Hartman, M. D.

On the Development of Lemna Minor, by Wm. Barbeck.

Description of a new species of Hemitripterus from Alaska, by W. N. Lockington.

Description of a new species of Catostomus (Catostomus chopy) from the Colorado River, by W. N. Lockington.

PROCEEDINGS OF THE MINERALOGICAL AND GEOLOGICAL SECTION OF THE ACADEMY OF NATURAL SCIENCES OF PHILADELPHIA.

A New Polariscope; A Garnet with Inverted Crystallization; The Minerals of Surry Co., N. C.; A new locality for Lignite; On Serpentine in Bucks Co.; The Iron Ores and Lignite of the Montgomery Co. Valley; An Enclosure in Quartz; On a new Fucoidal Plant from the Trias; The Trenton Gravel and its relation to the Antiquity of man; Note on Philadelphite—a new Mineral; A new locality for Siderite; Magnetic Markings in Muscovite; A new locality for Asbolite; Epidote in Molybdenite; The Optical Characters of some Micas; On the Measurement of Plane Angles; On an Exfoliated Talc; Tin in North Carolina; On Siderophyllite—a new mineral; On Sterlingite and Damourite; Vanadium in Philadelphia Rocks; A new locality for Epsomite; The Surface Geology of Philadelphia and vicinity; On the Bryn Mawr Gravel; On some enclosures in Mica; On Dendrites; On a Jurassic Sand; On Philadelphite (Sp. Nov.); A Potsdam Sandstone Outcrop on the S. Valley Hill of Chester Valley; all by H. C. Lewis.

A new locality for Amethyst; A new Corundum locality; Menaccanite and Talc from Maryland; Sunstone in Labradorite; A new locality for Fluorite; all by W. W. Jefferis.

Fossil (?) Casts in Sandstone; Garnet mistaken for Corundum; by Dr. J. M. Cardeza.

On a peculiar Stratification in Gneiss; The Northern Belt of Serpentine in Radnor Township; Change of Serpentine into Quartz; A new locality for Millerite; A new locality for Gypsum; Chromite near Radnor, Pa.; On Randite; Some Microscopic Enclosures in Mica; Potsdam Sandstone near King of Prussia; all by Theodore D. Rand.

On a probable Pseudomorphism of Gummite and Uraninite; A new locality for Analcite; On Large Sphene from Canada; all by A. E. Foote.

Analysis of of Philadelphite, by Reuben Haines.

The so-called Emery ore from Chelsea, Bethel Township, Del. Co., Pa., F. A. Genth, Jr.

Some new Mineral localities, by Jos. Willcox.

Fresh-water Sponges of Fairmount Park, by Edw. Potts.

Notes on Jarosite, by Geo. A. Koenig.

Rhizopods in the Mosses of the Summit of Roan Mountain, N. C.; Bone Caves of Pennsylvania, by Jos. Leidy, M. D.

On the Timber Line of High Mountains; Dimorphic Flowers in Houstonia; Cleistogamy in Oxalis Acetosella, L., by Thos. Meehan.

On the Timber Line of High Mountains, by J. H. Redfield.

Sexual Variations in Castanea Americana, by Isaac C. Martindale.

We propose to prepare abstracts of the most important of these papers for publication in this Journal. That by Dr. H. C. Chapman, on the structure of the Ourang Outang, will probably be found in another portion of this issue.

HANDBOOK OF SYSTEMATIC URINARY ANALYSIS, CHEMICAL AND MICROSCOPICAL.—BY FRANK M. DEEMS, M. D.—The Industrial Publication Company, New York, 1880.

As a laboratory instructor in the medical department of the University of the city of New York, Dr. Deems must have acquired just the right sort of knowledge to fit him to write such a work.

The aim of the author appears to have been to offer a concise manual on urinary analysis, and to accomplish this end he has tabulated and arranged a large amount of matter, so that within a few pages and almost at one view the essential details of the subject are presented in a form for very rapid reference.

Several small handbooks have been recently published on this subject, which bear a remarkable likeness to one another, and we are glad to see that Dr. Deems has struck out in an original course, and produced a useful book which does not pretend to take the place of the larger works, but will be found of special value to medical students and physicians who require a synopsis of all the facts which it is important to remember in actual practice.

SOCIETY OF AMERICAN TAXIDERMISTS.

The first annual exhibition of the "Society of American Taxidermists," was held at Rochester, N. Y., commencing Dec. 14th and continued eight days. This Society, which is national in its character, was organized in Rochester, March 24th of the current year, with F. S. Webster as President and W. F. Hornaday, Secretary. It now numbers over forty active members besides several honorary members. Its scope is to advance the interest and raise to a higher standard of excellence the work in the line of science which its name indicates.

The exhibit consisted of about one hundred cases of birds in groups and perhaps twice that number of individual specimens ranging from a humming bird to an American Bison.

Perhaps the neatest thing, as "a thing of beauty," was a white heron mounted as a medallion on black velvet in an appropriate frame—the work of Mr. Webster.

The next meeting will be held at either New York or Boston, and as the initiatory one at Rochester was very successful in a pecuniary way, it can hardly fail of success in a large city.

The American Chemical Society will hold its first meeting of 1881 on Monday evening, January 3, at Room No. 1, University Building, Washington Square.